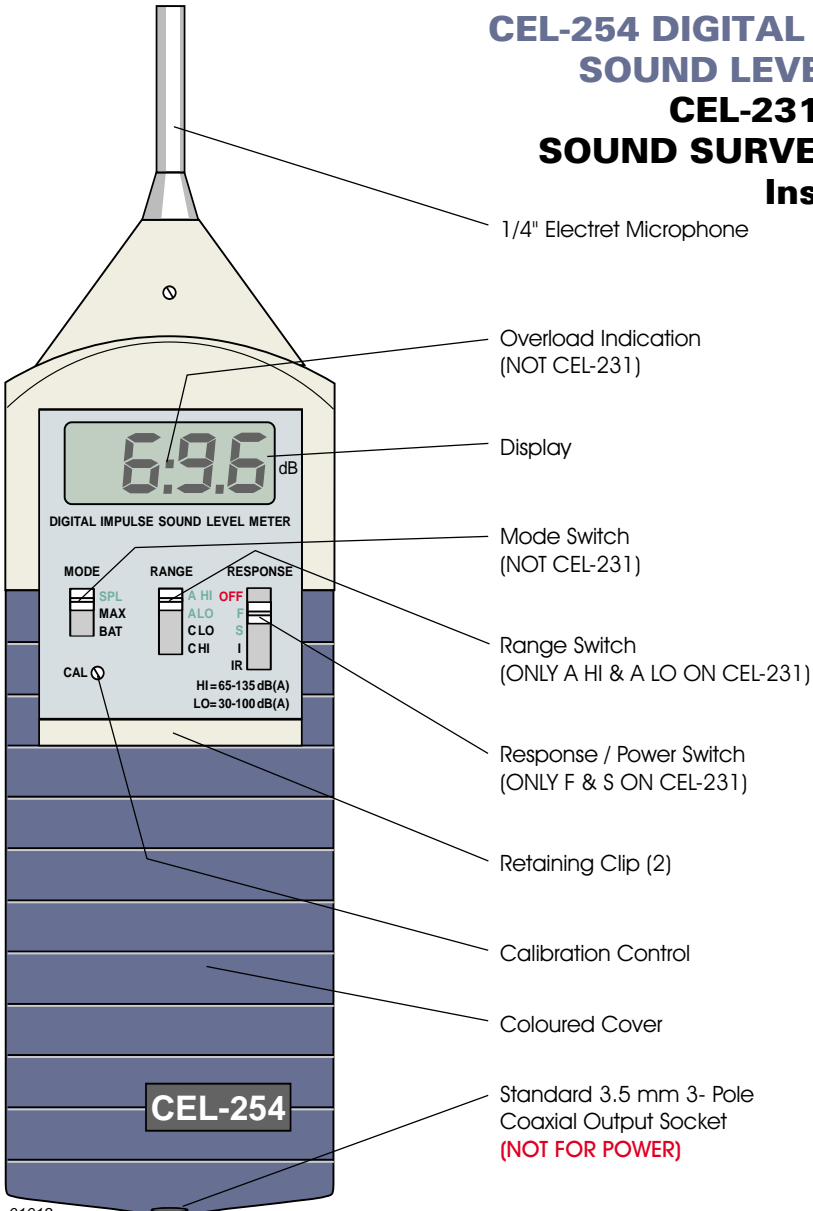


CASELLA

CEL

CEL-254 DIGITAL IMPULSE SOUND LEVEL METER CEL-231 DIGITAL SOUND SURVEY METER Instructions



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CE Compliance

The CEL-231 and CEL-254 Sound Level Meters comply with the EMC Directive 89/336/EEC of the European Union. They have been tested according to the standard delivery schedule and comply with the following standards.

EN 50081-1: 1992 & EN 50081-2: 1993
Generic emission standards for residential,

commercial, light industry and industrial environments.

EN 50082-1: 1992 & EN 50082-2: 1995
Generic immunity standards (for both RF fields and electrostatic discharge) for residential, commercial, light industry and industrial environments.

Manufacturers Servicing & Warranty Arrangements

In order to ensure its rigid conformity with the requirements of the specification, this instrument is thoroughly inspected and calibrated prior to dispatch from the factory. All technical information for an individual instrument is filed under the instrument serial number. Therefore, the serial number should be quoted in any correspondence concerning the instrument.

The manufacturers undertake to rectify any defect in the instrument that is directly attributable to faulty design or assembly, and which becomes apparent during the warranty period. In order to take advantage of this warranty, the instrument must be returned, carriage paid, to the manufacturer's factory or accredited agent, where necessary repairs will be carried out.

Normally, the warranty period runs for 12 months from the date of receipt of goods, with exceptions on certain specialised components supplied by other manufacturers which are warranted for shorter periods. Some of the specialised components used in this instrument may be subject to longer guarantees by their actual manufacturers, and in all such cases, the benefit of these undertakings will be passed on to the user. However, Casella CEL Ltd's liability is limited to items of their own manufacture, and they do not accept liability for any loss resulting from the operation or interpretation of the results from this equipment.

A comprehensive Instrument Calibration Maintenance Agreement (ICMA) scheme is available to extend the initial warranty period of this instrument. At the end of the first warranty period, it is recommended that the equipment be returned to the Service and Re-calibration Department at Bedford, where it will be inspected and entered into the ICMA scheme as required. The warranty will then be extended for the period stated on the individual schedule. Please contact your local Casella CEL agent for full details of this service.

In the event of a malfunction developing during the warranty period, the instrument should be carefully packed and returned either to Casella CEL's local agent, or in the case of domestic sales, to the Service Department at Bedford.

Please include the following information:
Instrument Type(s) and Serial Number(s),
Customer name and address,
Contact name and phone number,
Reason for returning the equipment with a detailed description of the fault.

The necessary adjustments or repairs will be carried out, and the instrument returned as soon as possible. After the warranty has expired (except on approved accounts) service work is undertaken against quotations, and all packing and transit costs are charged extra.

CEL and Dawe instrumentation is designed, manufactured, and serviced by:

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INTRODUCTION

The CEL-231 Digital Sound Survey Meter has been designed to meet the sound survey requirements of Safety Engineers and Occupational Nurses, while the more powerful CEL-254 Digital Impulse Sound Level Meter is designed for Industrial Safety Officers.

These specialists require inexpensive and easily used instruments to check whether industrial noise exposure areas require a more detailed investigation.

Both instruments satisfy the requirements of the international and national IEC 651 Type 2, BS EN 60651 : 1994 Type 2, and ANSI S1.4 Type 2A standards for both free field and random incidence sound level meters. The CEL-254 also satisfies the requirements of IEC 651 Type 2I for impulse sound level meters.

The instruments provide a clear and unambiguous digital indication of the A-weighted sound level on an easily read display. They feature the standard Fast and Slow time weightings, and can measure sound levels between 30 dB(A) and 135 dB(A) in two ranges, at frequencies between 10 Hz and 20 kHz.

In addition, the CEL-254 can indicate C-weighted sound levels and overload conditions, includes a standard Impulse time weighting with reset function, indicates battery voltage on the display, and has a maximum hold function that operates with all time constants.

Conditioned a.c. and logarithmic d.c. outputs are available from a single standard 3.5 mm 3 pole coaxial socket in both instruments, so they may be used with level/time and tape recording systems.

A complete "CEL-231 Sound Survey Meter" consists of the following items.

CEL-231	Sound Survey Meter,
032460/DP	Microphone Cover,
016022 (4 off)	Type AAA Manganese
	Alkaline Battery,
038055	Screwdriver,
060064/HB	Instructions.

A complete "CEL-254 Digital Impulse Sound Level Meter" consists of the following items.

CEL-254	Digital Impulse SLM,
032460/DP	Microphone Cover,
016022 (4 off)	Type AAA Manganese
	Alkaline Battery,
038055	Screwdriver,
060064/HB	Instructions.

The following accessories may be ordered separately to enable the user to gain the maximum advantage from the instrument.

CEL-284/2	Acoustical Calibrator Class 1L (complete with CEL-4725 Microphone Coupler),
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CEL-282	Acoustical Calibrator Class 2L (complete with CEL-4725 Microphone Coupler),
C4963/2	Tape Recorder Cable (2 m) with 3.5 mm jack plug & BNC plug for a.c. output,
C4964/2	Level Recorder Cable (2 m) with 3.5 mm jack plug & BNC plug for d.c. output.

PREPARATION FOR USE

Install four type AAA Manganese Alkaline batteries and the instrument is ready for use. Zinc carbon batteries are NOT suitable.

The two battery compartments are exposed when the coloured cover is removed as shown. One compartment in the front of the instrument inner case houses two batteries, with an identical compartment at the back.

Observe the battery polarities indicated in the figure and in each compartment, and replace batteries when LO BAT is indicated. Having inserted a set of batteries, replace the coloured cover and ensure that it is firmly held by the retaining clips.

On the CEL-254, the battery voltage (x10) can be displayed by sliding the MODE switch to BATT.

The instrument is now ready for operation.

CALIBRATION

Perform an acoustic calibration with a CEL-282 or CEL-284/2 Acoustical Calibrator immediately before and after measurement as follows.

1. Remove the Microphone Cover.
2. Fit the CEL-4725 Microphone Coupler on to the calibrator.
3. Push the calibrator and Coupler on to the Microphone, with the label at the top as shown.
4. Slide the Range switch to A HI (high range).
5. Slide the Response switch to F (fast) to switch the instrument on.

On the CEL-254, also slide the MODE switch to SPL (sound pressure level) for normal noise measurement.

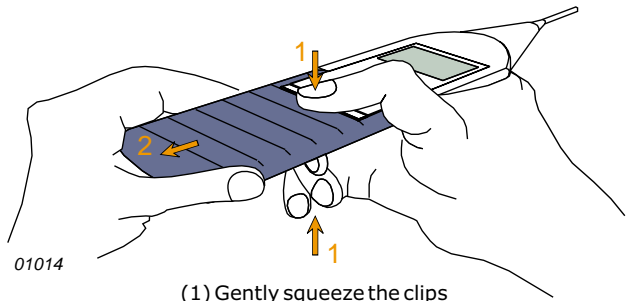
6. Wait 20 seconds for the instrument to stabilise.

A LO BAT message indicates that the batteries should be changed.

On the CEL-254, battery voltage (x10) can be indicated on the display by sliding the MODE switch to BATT.

7. Press the bottom of the calibrator switch to obtain the nominal 114 dB at 1 kHz.
On instruments supplied after 1-1-96, the meter display should read 113.6 dB while on earlier instruments it should read 114.0 dB.

- If necessary, carefully adjust the CAL control with the screwdriver provided until the indication is correct.
Two versions of the CAL control are found. One uses $\frac{3}{4}$ turn to give 9 dB of adjustment, while the other has 4 turns for 12 dB.
- Switch the calibrator OFF, when not in use.



(1) Gently squeeze the clips
(2) Then pull apart.

Other calibrators may be used with the Sound Level Meter, but the correct indication will depend upon the volume of the acoustic coupler used, the operating frequency, and the calibration level.

Pistonphones are not suitable because they operate at low frequencies, which produce incorrect reading when measured with A- or C-weighted circuits.

It is recommended that the calibration be verified at least every year. Contact the CEL Service Department for details.

OPERATION

- Insert batteries as described above.
- Calibrate the instrument.
- Switch the calibrator OFF.
- Remove the calibrator and microphone coupler.
- Select A HI (high) Range
On the CEL-254, C HI may also be selected.

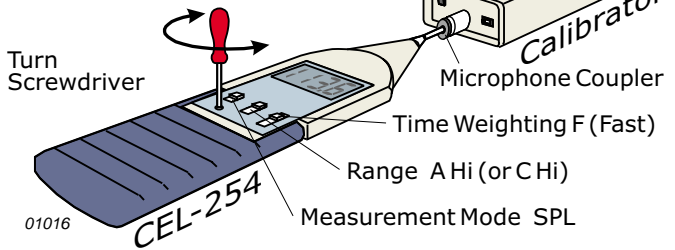
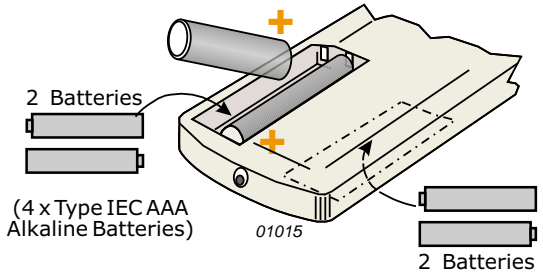
These ranges cover sound levels between 65 and 135 dB.

- Use F (fast response) for comparatively stable noise, or select S (slow response) for slowly varying noise.

On the CEL-254, I (impulse response) may be selected for more rapidly varying and impulsive noise.

Impulsive noises are captured and held on the display as A- or C-weighted levels for approximately 1.5 s.

Slide the RESPONSE switch to IR (impulse reset) to clear the display for the next noise measurement.



- Hold the instrument comfortably in the hand and point the microphone at the suspected noise source.

The sound level will be displayed.

- Select A LO (low) range when the indicated sound level falls below 80 dB(A).

On the CEL-254, C LO may also be selected. If OVERLOAD is indicated on the CEL-254, reset one of the HI ranges.

- On the CEL-254, slide the MODE switch to MAX (maximum hold function) to capture and hold maximum noise levels for longer periods using any time weighting and range.

Slide the MODE switch to SPL to clear the display for the next measurement.

10. Switch the instrument OFF (RESPONSE switch to OFF) when not in use.
11. Remove batteries when out of service for longer periods.

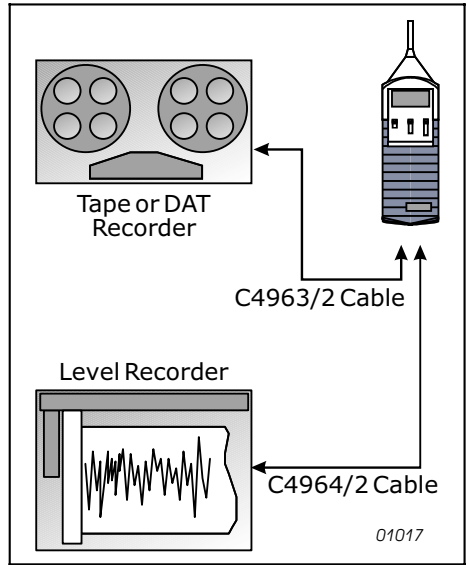
USE WITH RECORDERS

Connection for tape and level/time recorders (and X/Y recorders that can operate with time on the X axis) is made via the same 3.5 mm 3 pole coaxial socket in the bottom of the instrument, as shown.

Connection between the sound level meter and tape recorder is made via a C4963/2 (2 m) Cable terminated with a BNC plug. The connections in this cable provide a conditioned a.c output signal proportional to indicated sound level, with 7.25 V RMS full scale deflection.

Similarly, connection between the sound level meter and a level/time or X/Y recorder is made via a C4964/2 (2 m) Cable terminated with a BNC plug. The connections in this cable provide a logarithmic d.c output signal proportional to the indicated sound level, with nominally 25 mV/dB.

When recordings are to be made, it is recommended that the sound level meter be calibrated as described above, and that a



calibration level be incorporated into the recording. For more detailed instructions refer to the relevant recorder handbook.

The manufacturers reserve the right to change the contents of these instructions without notice.

Specification

Type:

Sound Level Meter according to ANSI S1.4 Type 2A, IEC 651 Type 2, and BS EN 60651 : 1994 Type 2.

The CEL-254 is also an impulse sound level meter according to IEC 651 Type 2I.

Dynamic range:

70 dB.

Typical instrument frequency range:

(within +0.5 to -3 dB)

Better than 10 Hz to 25 kHz in all ranges.

Accuracy: (under reference conditions)

±1 dB.

Lowest frequency for non-linear distortion <1 dB:

5 Hz.

CEL-231 Measurement ranges:

Range Setting	Frequency Weighting	Display Range	Primary Range IEC 651	Linearity* IEC 651
A LO (low)	A	30-100 dB	30-90 dB	30-90 dB
A HI (high)	A	65-135 dB	65-125 dB	65-125 dB

Note* that the lower reading is quoted at +10 dB on noise floor. Upper reading allows crest factor 3.

CEL-254 Measurement ranges:

Range Setting	Frequency Weighting	Display Range	Primary Range IEC 651	Linearity* IEC 651
A LO (low)	A	30-100 dB	30-86 dB	30-86 dB
A HI (high)	A	65-135 dB	65-121 dB	65-121 dB
C LO (low)	C	35-100 dB	35-86 dB	35-86 dB
C HI (high)	C	65-135 dB	65-121 dB	65-121 dB

Note* that the lower reading is quoted at +10 dB on noise floor. Upper reading allows crest factor 5.

Microphone type:

CEL quarter-inch diameter pre-polarised electret, typically 10 mV/Pa, Microphone permanently attached to the instrument.

The microphone meets Type 2 requirements for both free field and random incidence measurement.

Impedance to be substituted for microphone:

Not possible as microphone is permanently attached.

Contact CEL for method of measuring electrical performance.

Calibration reference conditions:

Free field perpendicular incidence,
 Ambient temperature: 20°C,
 Relative humidity: 65%,
 Measurement Range: Hi (high),
 Excitation SPL: 114 dB,
 Frequency: 1 kHz.

Effect of humidity on accuracy:

Less than ±0.5dB over the range 30 to 90% RH (provided there is no condensation), relative to the value at 65% RH and 40°C.
 Storage range: 20 to 95% RH non-condensing.

Effect of temperature on accuracy:

Less than ±0.5dB over range -10 to +40°C. For temperatures between +40 and +50°C it is recommended that the instrument be recalibrated at the operating temperature with a CEL-282 or CEL-284/2.

However above 40°C, accuracy within the limits of IEC 651 can be obtained using the following correction, where t is °C:

Corrected reading = display reading + 0.05(t-40).

Operating temperature range: -10 to +50°C.
 Storage range: -20 to +60°C.

Effect of magnetic fields on accuracy:

Negligible at all levels.

Lower than a reading of 30 dB(A) when tested according to IEC 651 clause 8.4.

Effect of vibration on accuracy:

Less than 3 dB when tested according to IEC 651 clause 8.3.

Directional response:

Within the limits of IEC 651.

Effect of operator:

Negligible when instrument held at arm's length with microphone pointing away from operator.

Frequency weightings:

A-weighting according to ANSI S1.4 Type 2A, and IEC 651 Type 2.

C-weighting according to ANSI S1.4 Type 2A, and IEC-651 Type 2.

Time weightings:

F (fast): 125 milliseconds,

S (slow): 1 second,

I (impulse): 35 millisecond rise time, 1.5 second decay time, with quick reset.

MAX: Holds noise readings of F, S, & I, with decay <1 dB / 5 minutes at temperatures <40°C.

Digital display:

3¹/₂ digits,
 7 segments,
 12.5 mm high characters,
 0.1 dB resolution.
 Display updated 3 times per second.

Functions indicated:

Sound level dB(A),
 Low battery level. (Indicated when battery falls below approximately 3.2 V).

Sound level dB(C),
 Battery voltage (x10),
 Overload,

Maximum SPL (A- or C-weighted).

Overload detection: (CEL-254 Only)

Pre-weighting overload detector, with 2.5 s dwell time.

Start up stabilisation time:

20 seconds.

Outputs:

Two outputs from standard 3 pole 3.5 mm coaxial socket with a.c on pin, d.c on intermediate, and ground on sleeve.

DC: Log. signal with nominal 25 mV/dB (offset by approx. 4 to 5 V) and not exceeding 6 V,
 125 ms rise & decay times for Fast,
 1 s rise time & decay time for Slow.
 35 ms rise time and 1.5 s decay time for Impulse.

Recommended impedance of load >27 kΩ.

AC: Conditioned signal, 7.25 V RMS for FSD,
 Recommended impedance of load >39 kΩ.

Batteries:

4 x IEC AAA Manganese Alkaline type.
 Battery life is typically better than 20 hours with continuous use.

Dimensions:

258 x 70 x 21 mm, (10 x 2.75 x 0.85 inches).

Weight:

200 g, (0.45 lb) excluding batteries.

CEL and Dawe Equivalent Identities

Instrument	Class 1L Calibrator	Class 2L Calibrator	Digital Sound Survey Meter	Digital Impulse SLM	Digital Integrating SLM	Personal Sound Exposure Meter
CEL Identity	CEL-284/2	CEL-282	CEL-231	CEL-254	CEL-269 (Obs)	CEL-272 (Obs)
Dawe Identity	D-1418D	D-1411E	D-1405E	D-1422C	D-1421D (Obs)	D-1423D (Obs)